

Remarks/Arguments:

A. Status of the Claims

Claims 1-17 and 12-33 have been withdrawn from consideration, pursuant to the earlier restriction requirement and election of species.

Claims 19-23 are amended herein to depend from Claim 18.

Claim 18 is amended herein to recite that the fluidity of the molten mixture is maintained by providing at least 0.5% by weight but no more than 5% by weight of Ti in the aluminum-based matrix alloy and by limiting any Mg in the aluminum-based matrix alloy to below 0.2% by weight, at least until completion of said distribution of said particles throughout said volume of said melt. No new matter has been introduced, as support for this amendment is found in Table 2 (page 16) and in Claim 1 of the application as originally filed.

New Claim 34, which depends from Claim 18, has been added. Support for new Claim 34 is found in Example 3 as filed, where an AA4xxx type alloy containing 4.2 weight % Si was employed. No new matter has been introduced.

B. Rejection of Claims 18-23 as Obvious over either US 2003-192627 ("Lee I") or US 6,592,687 ("Lee II")

Applicants traverse the rejection of Claims 18-23 under 35 USC Section 103(a) as being unpatentable over either US 2003-192627 to Lee et al. ("Lee I") or US 6,592,687 to Lee et al. ("Lee II"). Reconsideration and withdrawal of the rejection are respectfully requested in view of the claim amendments and arguments presented herein.

The alloys disclosed in Lee I and Lee II contain a minimum of 0.5 weight % magnesium (Mg). See Lee I abstract, lines 3-4, Paragraph [0020], and Paragraph [0023], lines 4-5 (...a minimum value for magnesium of no less than 0.5 wt %.) and Lee II abstract, line 4, Column 3, line 55, and Column 4, lines 24-25. In contrast, Applicants' claims, as presently amended, require that any Mg in the aluminum-based matrix alloy be limited to below 0.2% by weight, at least until completion of the distribution of the boron carbide particles throughout the volume of the

melt. Limiting the amount of Mg in this way has been surprisingly found to provide significant processing benefits, in particular the ability to control the fluidity of the molten aluminum-based matrix alloy while the boron carbide particles are being distributed throughout the volume of the melt. Applicants have unexpectedly discovered that if the Mg content during this step exceeds 0.2 wt %, the mixture may become too viscous to cast successfully. A worker of ordinary skill in the art would not have had any reasonably expectation that varying the processes taught by Lee I and Lee II by lowering the amount of Mg in this way would likely result in such improvements. In particular, neither Lee I or Lee II teach or suggest that controlling the Mg content of the melt while attempting to admix boron carbide particles into the melt would likely result in enhanced fluidity, thereby facilitating the addition of larger amounts of boron carbide. Applicants' claimed process thus is unobvious over the cited references.

C. Rejection of Claims 18-23 as Obvious over US 2003-0179846 to Murakami et al. ("Murakami") and US 4,786,467 to Skibo et al. ("Skibo")

Applicants traverse the rejection of Claims 18-23 under 35 USC Section 103(a) as being unpatentable over the combined teaching of US 2003-0179846 to Murakami et al. ("Murakami") and US 4,786,467 to Skibo et al. ("Skibo"). Reconsideration and withdrawal of the rejection are respectfully requested in view of the claim amendments and arguments presented herein.

Although Murakami does describe the incorporation of Ti at a level of 0.2 to 4 weight % into an Al alloy base phase also containing a boron compound such as boron carbide, the process steps utilized are substantially different from, and thus non-analogous to, the method recited in the claims of the present application that are currently under examination. That is, the aluminum composite material of the Murakami reference is manufactured by mixing together an Al or Al alloy powder, the boron compound and a powder of a Ti-containing additive element and sintering the mixture under pressure. In contrast, Applicants' invention is directed to a process comprising the steps of: providing an aluminum-based matrix alloy; preparing a molten mixture of from about 10 to about 40 volume percent of free-flowing boron carbide particles and from about 90% to about 60 volume percent of a melt of said aluminum-based matrix alloy; stirring the molten mixture to wet the matrix alloy to the boron carbide particles and to distribute the particles throughout the volume of the melt; and casting the molten mixture to form a cast composite material.

Given these profound differences in the processing steps, a worker of ordinary skill in the art would not have found it obvious to manufacture an aluminum composite material corresponding in composition to those described in Murakami by adapting the process taught by the Skibo reference wherein boron carbide particles are mixed into a molten metallic alloy.

As explained in the present application at page 10, line 23, through page 12, line 12, the fluidity and stability problems encountered when attempting to mix a relatively large level of boron carbide particles into a molten metallic alloy following the general procedure of the Skibo reference may be alleviated by controlling the Ti content of the melt. The Murakami reference would not have suggested this solution to a worker of ordinary skill in the art, given the very different processing conditions described in the reference. In other words, the possible role of Ti in influencing the fluidity and stability of a melt of an aluminum-based matrix alloy that is being admixed with boron carbide particles would not have been apparent to such worker, since the alloy preparation procedure described by Murakami involves mixing of powders and sintering, where no alloy melt is involved.

Appn. No.: 10/532,188
Amendment Dated February 2, 2009
Reply to Office Action of October 9, 2008

ALCN-117US

Applicants respectfully submit that the application is in condition for allowance and request that the application therefore be passed to issuance. If any matters or issues remain open, the Examiner is asked to contact Applicants' Attorney at the telephone number shown below.

Respectfully submitted,



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Dated: February 2, 2009

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